

Materials Tip



Materials Engineering Branch

Reduction in Stress Corrosion Cracking Sensitivity of Finish Machined 7075-T6			
No. 122		Date revised: (First issued:)	17 January 2001 (March 1997)
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One of the strongest aluminum alloys is 7075 in the T6 heat treat condition. However, the alloy with this heat treatment has very low resistance (Table III, Ref.) to stress corrosion cracking (SCC) and may crack at applied tensile stress levels as low as 10% of its yield strength (see Reference). Such susceptibility is greatest in the short transverse direction, and somewhat less in the long transverse direction, as related to the worked direction of the original stock. Materials TIP No. 13 explains more about aluminum alloy SCC.

To achieve the T6 condition, the 7075 alloy is solution treated at 890°F, quenched, and then precipitation hardened at 250°F for 24 hours. The rapid cooling (quench) results in a concentration of compressive stresses on the surfaces and also tensile stresses within the interior of the section. Subsequent asymmetrical machining results in unbalanced stresses and high surface sustained tensile stresses (Figure 4, Reference). Therefore, SCC can take place under the influence of residual tensile stresses even in a cleanroom. The resistance to SCC by this alloy can be substantially increased by adding an 18 hour aging treatment at 325°F to produce a T76 heat treatment condition. The T76 condition increases the short transverse SCC threshold stress from 7 ksi for the T6 condition to 25 ksi or Table II (Ref.). This heat treatment can often be accomplished on finish machined piece parts without distorting them or changing their dimensional tolerance limits.

Reference:

Design Criteria for Controlling Stress Corrosion Cracking, MSFC-SPEC-522B, July 1, 1987, Marshall Space Flight Center, MSFC, Alabama 35812